

GCSE OCR Computer Science

Practice Set B

Paper 2

Computational Thinking, Algorithms and Programming

Time allowed:

- 1 hour 30 minutes

You **may not** use a calculator

Centre name					
Centre number					
Candidate number					

Surname
Other names
Candidate signature

Instructions to candidates

- Write your name and other details in the spaces provided above.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information for candidates

- There are 80 marks available on this paper.
- The marks available are given in brackets at the end of each question.

For examiner's use							
Q	Attempt N ^o			Q	Attempt N ^o		
1				5			
2				6			
3				7			
4							
Total							

1. (a) Rank the following amounts of data in order of size, with 1 being the largest and 5 the smallest.

Data	Order of size
3 MB	
6 nibbles	
1.6 PB	
500 TB	
2 bytes	

[3 marks]

- (b) '65' represents different numbers in the denary and hexadecimal systems.

- (i) Convert 65 from a denary number into an 8-bit binary number.

.....

.....

[1 mark]

- (ii) Convert 65 from a hexadecimal number into an 8-bit binary number.
You must show your working.

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[2 marks]

- (c) Add together the following two binary numbers:

$$\begin{array}{r} 1\ 0\ 0\ 1\ 1\ 1\ 1\ 1\ + \\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ \\ \hline \end{array}$$

[2 marks]

- (d) An overflow error can occur when adding two 8-bit binary numbers. Describe what is meant by the term 'overflow error'.

.....
.....
[1 mark]

- (e) Character sets are collections of characters that a computer recognises from their binary representation. One example of a character set is ASCII. State the name of **one** other character set used in computer systems, and describe a feature of this character set.

Character set

Feature

.....
[2 marks]

2. Keil is a musician in a rock band. He regularly takes photographs of their concerts and posts them to social media sites.

- (a) Explain how reducing the resolution of a photograph will affect its file size.

.....
.....
[2 marks]

- (b) State **two** pieces of metadata that could be included with a photograph.

1

2

[2 marks]

- (c) Keil uses software to record himself playing the drums.

- (i) He uses a microphone to capture the sound. Explain how Keil's computer is able to create an audio file from this.

.....
.....
.....
[2 marks]

Turn over ►

- (ii) Keil presses the 'record' button in his software. Recording begins after he has followed prompts to enter the bit rate and frequency. The software then uses the frequency and bit rate to sample the audio captured by his microphone. The recording stops when Keil presses the 'stop button', or if the file reaches 1.5 GB in size, which causes an alert message to be displayed. After the recording stops, a prompt asks him to choose a name for the file, which is then saved.

Write an algorithm for the process above after the 'record' button is pressed.

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[6 marks]

- (d) Keil needs to convert his audio files into a compressed format before uploading them to a web server. He can choose between formats with lossy and lossless compression. Describe **two** differences between lossy and lossless compression.

1

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.....

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2

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.....

.....

[4 marks]

3. Claudio is the manager of a bookshop. He is designing a program to calculate each staff member's sales over the month. The program will then calculate a pay bonus. He has written the following pseudocode so far.

```

01  do
02      name = input("Enter staff name")
03      sales = 0, total = 0, bonus = 0
04      do
05          sales = input("Enter value of item sold (£)")
06          total = total + sales
07      until sales == 0
08      bonus = total * 0.1
09      print(name, " has sold £", total, " and gets a £",
            bonus, " bonus.")
10      continue = input("Continue? (Y/N)")
11  until continue == "N"

```

- (a) Identify which of the following the pseudocode uses:
sequence, selection or iteration.

..... [1 mark]

- (b) State the purpose of the following lines in the algorithm above.

03

 06

 07

 08
 [4 marks]

- (c) Give the output of the program if Claudio inputs the following data:

Jesse, 60, 120, 20, 0, Y, Anabelle, 70, 50,
 40, 0, Y, Roland, 19, 11, 0, N

.....

 [3 marks]

Turn over ►

(d) Outline **one** way that Claudio can improve the robustness of the program.

Leave
blank

.....

.....

[1 mark]

(e) Write Claudio's pseudocode as a flowchart, with the following functionality added:

- Increase the bonus to 15% if the employee has sold more than £500 of books.
- Decrease the bonus to 5% if the employee has sold £100 of books or less.

[6 marks]

4. Vivienne has a list of fruit and vegetables stored in a data structure.

Grape	Pear	Tomato	Fig	Mango	Kale	Apple	Cherry
-------	------	--------	-----	-------	------	-------	--------

- (a) Identify the most appropriate data structure to store the data above.

..... [1 mark]

- (b) Use a merge sort algorithm to arrange this data in alphabetical order, showing each stage of the process clearly.

.....

 [3 marks]

- (c) Show the stages of a binary search, used on the sorted list, to find 'Cherry'.

.....

 [3 marks]

- (d) Give **one** other searching algorithm that Vivienne could use.

..... [1 mark]

Turn over ►

5. Julian is writing some software to help him process and store temperature data. To assist with programming, he is using an Integrated Development Environment (IDE).

- (a) The IDE that Julian is using offers many common tools and facilities. Outline how the following features will help Julian develop his program:

Error diagnostics

.....

.....

Run-time environment

.....

.....

[2 marks]

- (b) Julian needs to decide whether to test his program using 'iterative testing' or 'final testing'. Describe **two** differences between these kinds of testing.

1

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2

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[4 marks]

- (c) To convert temperatures from Fahrenheit to Celsius, subtract 32 from the temperature in Fahrenheit, then divide by 1.8. Julian's code includes a subprogram, `convertFC`, which is designed to do this. His first draft of the code is given below:

```
function convertFC(temp)
    C == temp - 32 / 1.8
    return C
endfunction
```

Identify a logic error and a syntax error in Julian's code.

Logic error

Syntax error

[2 marks]

Leave
blank

(d) Julian needs to write a program with the following functionality:

- Create a text file called 'Daily_Temps.txt'.
- Allow the user to input the date and temperature (in Fahrenheit) for as many dates as they want.
- Write the date and the temperature in both Fahrenheit and Celsius to 'Daily_Temps.txt'.
- Close the file once finished.

Write the code for this program. You should use the `convertFC` function and assume that any errors in it have been corrected.

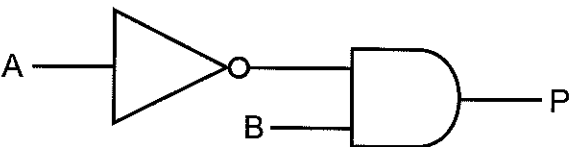
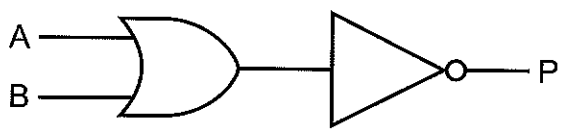
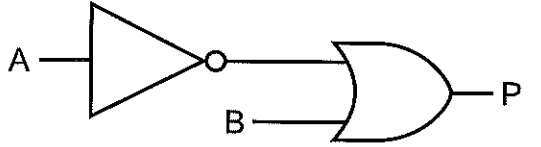
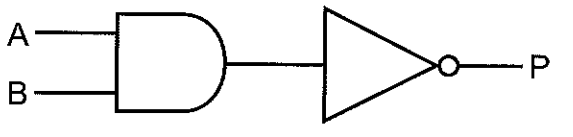
[illegible]

[6 marks]

Turn over ►

6. (a) Match the following logic diagrams to the correct Boolean logic statements.

Leave
blank

Logic Gate	Boolean Logic
	$P = (\text{NOT } A) \text{ OR } B$
	$P = (\text{NOT } A) \text{ AND } B$
	$P = \text{NOT } (A \text{ AND } B)$
	$P = \text{NOT } (A \text{ OR } B)$

[2 marks]

- (b) Complete the truth table for the logic statement $P = \text{NOT } (A \text{ AND } B)$.

A	B	P

[3 marks]

(c) The main entrance to a university library uses Boolean logic to determine whether or not the door will open. The door requires a person to scan their library card. It then prompts them to enter a 4-digit passcode.

Write an algorithm for this process that includes the use of Boolean variables named `libraryCardValid`, `passwordValid` and `openDoor`.

[illegible]

Turn over ►

7. Tabitha is designing a control system for her greenhouse. Every 6 hours the system will check the soil moisture level. If the moisture level is below 30 it will water the plants until the moisture level rises above 50. She has written the following pseudocode:

```

01  water = false
02  soilMoisture = input from sensor
03  print("Soil moisture reading is " + str(soilMoisture))
04  if soilMoisture < 30 then
05      do
06          water = true
07          wait 3 seconds
08          soilMoisture = soilMoisture + 1.5
09      until soilMoisture > 50
10      print("Watering complete")
11      water = false
11  else
12      print("No watering needed")
13  endif

```

- (a) State the line (or lines) in Tabitha's pseudocode where the following features appear.

Feature	Line(s)
Boolean data	
Casting	
Iteration	
String data	

[4 marks]

- (b) Tabitha's code assumes that 3 seconds of watering will increase the soil moisture level by 1.5. Tabitha decides that this figure is inaccurate and changes line 08 to the following.

```

08          soilMoisture = soilMoisture + 1.2

```

Explain how this change will affect the amount of water the plants receive.

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[2 marks]